

THE NAUTILUS.

VOL. XIV.

FEBRUARY, 1901.

No. 10.

A CONTRIBUTION TO WEST COAST CONCHOLOGY.

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Between San Diego and Point Conception, a distance of about two hundred miles, there lies off the coast of Southern California (not Lower California) a number of islands generally called the Santa Barbara group. In all, there are eight of these islands, varying in length from one to thirty miles and from one to six or eight miles in width, the nearest being about twenty-five, and the most distant about seventy-five miles from the mainland.

All of them bear the name of some saint whom tradition, superstition and religion have invested with supernatural power for good or evil toward men. Beginning with the most northerly island of the group and ending with the most southerly one, their names run as follows: San Miguel, Santa Rosa, Santa Cruz, Anacapa, San Nicolas, Santa Barbara, Santa Catalina, and San Clemente.

Here is an array of saintly names that should satisfy the most devout, and, if there is any virtue in a name, it should bring peace, hope and quiet rest to those whose lot might be cast upon these rock-ribbed and storm-beaten islands. But this does not seem to have been the case, for when they were first discovered by the old Spanish or Portuguese navigators, colonies of peaceful and, perhaps, happy Indians inhabited them, whose time and occupation in life was principally devoted to securing something to eat and very little to wear. Soon after the advent of the white man these poor creatures began to disappear, decreased in numbers, and finally became extinct. There still remain evidences of their home life, the shell heaps on their old

camping-grounds, an occasional broken stone-implement, and a few shell ornaments that have been over-looked by the white man in his search for curios or prehistoric relics.

Several theories have been advanced by scientists and others in regard to the origin and age of these islands, but I can add very little to these flights of the imagination. How often, if more than once, all or some of them have been submerged and raised above the sea level, or whether those of the group which are composed principally of metamorphic rocks are the remains of the highest peaks of a range of mountains that once formed or ribbed the most western part of the continent, it is quite impossible to say.

San Nicolas Island, however, is of sand-stone formation, and contains beds of marine fossils, the forms being similar to those now living all along the coast of the mainland, and I think we are safe in suggesting that this island was thrown up at or about the time the general elevation of the coast line and adjacent mesa-lands took place.

There are always some curious expectations associated in the human mind with thoughts of the islands of the sea. To the conchologist these expectations are often greatly multiplied, and these little isolated patches of land become intensely interesting, and especially so to the student of terrestrial mollusks, for the islands of the sea the world over are noted for their richness in land shells.

In this respect, our Californian islands are no exception to the general rule. While the number of so-called species found upon them, so far as we know them at present, is not very numerous, several are peculiar to these islands and not found elsewhere, while their coloring, varied through closely related forms, adds unusual interest and makes them very desirable for study, especially by those who are interested in problems of evolution.

The origin of the land shells of these islands and of the west coast generally has been the subject of speculation by various writers on the distribution of animal life for some years. In their attempts to account for the affinities and resemblances, in a few instances, between our land shells and some forms found in Asia, they have bridged over Bering Strait, or "Behring Straits," several times had bands of snails, or perhaps single ones "in pairs," as Pat would express it, cross this bridge into America, travel southward to Cape Horn, establish colonies all along this long line of travel, and subsequently spread eastward over the continent, and finally cross another imagin-

ary bridge into the West Indies; and the present shell fauna of this whole region is supposed to be the descendants of those Asiatic emigrants.

We are also to infer from these theorists and their writings, I suppose, that during the time this "dispersion" of Asiatic snails took place there was not a native terrestrial mollusk in all this land, no matter what other kind of organisms may have originated and existed here at that time.

In order to have a clear and comprehensive conception of life, the origin and development of the material forms of organisms, and their distribution over our planet, we must study them all from a fundamental standpoint, and I will here briefly allude to the fundamental as I understand it.

Time and space are infinite. Existing within the infinite there are elements that possess the properties of attraction and repulsion (energy—life), which, by their combinations, form two great factors that enter into and produce all the phenomena we see around us. These we know as energy and matter. Their relations to each other may be more clearly understood by stating that without energy matter could not be formed, and without matter energy could not demonstrate its presence, as it would have nothing to act upon, hence both are necessary to a demonstration of any kind, and must be regarded as equals in every respect. Development is a principle inherent in the elements—the hand-maid of life itself. Evolution, diversity and variation are natural processes belonging to development. These constitute the fundamental; they are coexistent and immortal, eternal, without beginning and without end. The fundamental alone is immortal; all the phenomena arising from the fundamental, the superficial and complex, are evanescent, fleeting and constantly passing away, even as the grass of the meadows and the forests of the plains, and are replaced by other similar phenomena, though varied in form. Development is the regular order of nature, and the regular order of development is from the simple to the complex and *vice versa* (disintegration). Wherever matter, heat, moisture and air exist together, there life (omnipresent energy, Howison), with her hand-maid development, will be found industriously refining and preparing inorganic matter, from which they will evolve organic forms in due course of time.

As the form and structure of terrestrial mollusks are not of a very

high or complicated nature, we may suppose that not many centuries would pass, after the Rocky, Sierra Nevada Mts. and the adjacent territory rose above the "Mesozoic Sea," before these creatures would originate, perhaps in many places at or about the same time; and as they multiply in numbers quite rapidly, under favorable conditions, there would have been a large native population of terrestrial mollusks existing here long before those Asiatic stragglers could have reached Cape Horn and the West Indies via Bering Straits bridge. If the present land shells of America are the descendants of Asiatic emigrants, what has become of the land shells that have originated here?

"Westward the course of empire takes its way" is as true as it is poetical, and if animals obey the same general laws that human beings do in this respect, then the snail emigration must have been the other way. We can as readily imagine bands of snails from America crossing this bridge at Bering Strait and establishing colonies on the other side as *vice versa*, and thus we could account for these resemblances and affinities by a westward movement as well as by an eastward emigration of these slow-moving creatures, if there were no causes or conditions in the environment in both countries to produce similar results in the organic structure of the same class of animals, which I believe is the case.

Without having investigated the matter very closely, I am under the impression that the resemblances and affinities of the West Coast shells, as well as those of America generally, are as close to those of Europe as they are to the shells of Asia. Compare the following American and European shells:

<i>American.</i>	<i>European.</i>
Helix nickliniana Lea.	Helix arbustorum Linn.
Helix kelletti Fbs.	Helix aspersa Müll.
Helix levis Pfr.	Helix pisana Müll.
Helix inflecta Say.	Helix personata Drap.
Patula striatella Anth.	Patula rudrata Stud.

Compare the entire *Zonitidæ* of both continents. Many of *Limnæidæ*, *Physidæ* and *Planorbidæ* on both sides of the Atlantic Ocean are identical, or so near alike that they could hardly be separated if mixed together.

I think, then, we may reasonably conclude that if the emigration